A CHEMICAL MODEL OF COMET HALLEY.

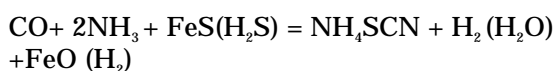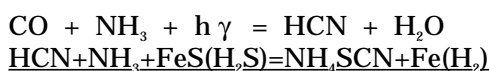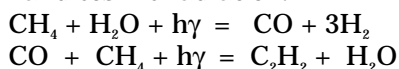**A CHEMICAL MODEL OF COMET HALLEY.** B.M. Andreichikov [1], Yu.P. Dikov [2], [1]Space Research Institute,Russian Academy of Sciences, 117810,Profsojuznaya 84/32, GSP-7, Moscow, Russia, E-mail: Ildus <ildus@mx.iki.rssi.ru> [2]Institute of Ore Deposits, Petrography, Mineralogy and Geochemistry, Russian Academy of Sciences.

In analysis of the mean ionic abundances of chemical elements of the heavy (10^{-12} – 5×10^{-16} g) and light (less than 5×10^{-16} g) dust particles of Comet Halley the first thing that attracts our attention is their striking difference in relation to light (such as H, C, O, N) chemical elements [1].

As the autors of this work consider that, taking in account of the weight factor, a satisfactory correspondence has been found between the mean ionic composition of the comet dust and the sun abundances for such elemets as Mg, Si, Fe, S, it seems to be logical to expand this conclusion for more light elements.

Then we can make a normative reconctruction of the chemical features of the comet itself, based on this supposition. For the heavy particles the measured ration H/C is 5,7. A part of hydrogene is combined with oxygene, distributed in the molecules of water and in mineral phases such as hydrooxides, hydrosilicates and hydrocomlexes, another part is used for nitrogen - hydrides, such as NH_3 , NH_4OH. As a result residual ration H/C will be almost 4,029 and consequently the main hydrocarbon component of the heavy particles will be methane.

A similar analysis of the composition of the light particles shows the likeness of the their mineral (silicate-sulfide) composition to the composition of the heavy particles., but the ration H/C is almost equal to one, that allows us to draw a conclusion that the light particles are derivates of the heavy ones in the process of the their evolution under the influence of sun and cosmic radiation.

$$CH_4 + H_2O + h\gamma = CO + 3H_2$$
$$CO + CH_4 + h\gamma = C_2H_2 + H_2O$$

$$CO + NH_3 + h\gamma = HCN + H_2O$$
$$\underline{HCN + NH_3 + FeS(H_2S) = NH_4SCN + Fe(H_2)}$$

$$CO + 2NH_3 + FeS(H_2S) = NH_4SCN + H_2(H_2O) + FeO(H_2)$$

So as a result of such changes the primal substance of the comet loses methane and water, either by forming complex compounds of metalls with the unlimited hydrocarbones, or by oxidizing them, In this process the mineral part of the heavy particles is transformed less than the HCON components.

The above shown results of the analysis to suppose a chemical model of the comet as follows:

- solid core, which consists of the mixture of methane, ammonia and, perhaps, hydrosulfide (that is, the simplest hydrides C,N,S) with mineral and complex compounds.

- outer rim (mantle), which consists of the products of transformation of substance under the influence of sun and cosmic radiation. The main part of this rim consists of complex compounds Mg and Si with unlimited hydrocarbones (preeminently with acetylene) in a mixture with HCN, NH_4SCN and also with to a various degree metamorphized mineral particles.

- gas-dust cloud, where are present particles of core and mantle and the products of their subsequent evolution.

More detailed information about the chemical composition of the solid substance of the comet can be acchieved by a more split differentiation of the data of ionic composition according to masses.

References

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